Notice No. 1 Corrigenda

Rules and Regulations for the Classification of Naval Ships, January 2015

The status of this Rule set is amended as shown and is now to be read in conjunction with this and prior Notices. Any corrigenda included in the Notice are effective immediately.

Issue date: March 2015

Amendments to	Effective Date
Volume 1, Part 1, Chapter 1, Section 5	Corrigendum
Volume 1, Part 1, Chapter 2, Sections 1, 3, 4, 6 & 7	Corrigenda
Volume 1, Part 1, Chapter 3, Sections 1, 2, 4, 5, 7, 11, 13, 14 & 15	Corrigenda
Volume 1, Part 3, Chapter 1, Sections 1, 2, 5 & 6	Corrigenda
Volume 1, Part 3, Chapter 2, Sections 1, 2, 3, 5 & 6	Corrigenda
Volume 1, Part 3, Chapter 3, Sections 2, 3, 4, 5 & 6	Corrigenda
Volume 1, Part 3, Chapter 5, Section 10	Corrigenda
Volume 1, Part 3, Chapter 6, Section 5	Corrigendum
Volume 1, Part 4, Chapter 1, Section 7	Corrigendum
Volume 1, Part 4, Chapter 2, Section 8	Corrigendum
Volume 1, Part 5, Chapter 2, Section 2	Corrigendum
Volume 1, Part 5, Chapter 4, Section 3	Corrigenda
Volume 1, Part 6, Chapter 3, Sections 2, 3, 8, 12 & 16	Corrigenda
Volume 1, Part 6, Chapter 6, Sections 2 & 4	Corrigenda
Volume 2, Part 1, Chapter 2, Section 5	Corrigendum
Volume 2, Part 1, Chapter 3, Sections 3, 4 & 5	Corrigenda
Volume 2, Part 2, Chapter 1, Sections 9, 10, 12 & 15	Corrigenda
Volume 2, Part 2, Chapter 2, Section 10	Corrigendum
Volume 2, Part 2, Chapter 3, Section 7	Corrigenda
Volume 2, Part 3, Chapter 1, Sections 8 & 9	Corrigenda
Volume 2, Part 4, Chapter 4, Section 8	Corrigendum
Volume 2, Part 5, Chapter 1, Section 3	Corrigendum
Volume 2, Part 7, Chapter 2, Sections 1 & 7	Corrigenda
Volume 2, Part 7, Chapter 3, Sections 2, 3, 4, 6, 8, 9 & 12	Corrigenda
Volume 2, Part 7, Chapter 4, Section 2	Corrigenda
Volume 2, Part 7, Chapter 5, Sections 4 & 8	Corrigenda
Volume 2, Part 8, Chapter 1, Section 18	Corrigendum
Volume 2, Part 11, Chapter 2, Section 4	Corrigenda
Volume 2, Part 11, Chapter 3, Section 1	Corrigendum
Volume 2, Part 12, Chapter 1, Sections 3 & 9	Corrigenda
Volume 3, Part 1, Chapter 4, Section 1	Corrigendum
Volume 3, Part 1, Chapter 5, Section 6	Corrigendum

Lloyd's Register

Working together
for a safer world

Volume 1, Part 1, Chapter 1

General Regulations

CORRIGENDUM

■ *Section 5*

(*Part only shown*)

5.1 LR has the power to adopt, and publish as deemed necessary, Rules relating to classification and has (in relation thereto) provided the following:

(e) Notwithstanding the general duty of confidentiality owed by LR to its client in accordance with the LR Rules, LR clients hereby accept that, LR will participate in the IACS Early Warning System which requires each IACS member to provide its fellow IACS members and Associates with relevant technical information on serious hull structural and engineering systems failures, as defined in the IACS Early Warning System (but not including any drawings relating to the ship which may be the specific property of another party), to enable such useful information to be shared and utilised to facilitate the proper working of the IACS Early Warning System. LR will provide its client with written details of such information upon sending the same to IACS Members and Associates.

Volume 1, Part 1, Chapter 2

Classification Regulations

CORRIGENDA

■ *Introduction*

Definition of ~~Hull~~ Naval Class

Transfer of Information

To achieve naval class it is imperative to ensure that communication between LR, the Owner, Naval dministration, Prime Contractor, ~~Designer~~ designer and Builder is effective. In designing, building and maintaining a ship to class, it is essential that liaison between the various parties involved is assured. In particular, formal written contracts are essential for commercial reasons between the contractors, but an additional responsibility rests with all participants to ensure that naval class leads to a transparency of information during construction and thereafter.

■ *Section 1*

Conditions for Classification

1.1 Framework of Classification

1.1.11 It is a requirement that where a vessel operates aircraft, it is ~~Classed~~ classed in accordance with the requirements of the ~~AIR~~ **AIR** notation defined in Pt 4, Ch 2,10 for the landing, manoeuvring and parking areas.

1.1.14 Where an ~~on board~~ onboard computer system having longitudinal strength capability, which is required by the Rules, is provided on a new ship, or newly installed on an existing ship, then the system is to be certified in respect of longitudinal strength in accordance with the document entitled *Approval of Longitudinal Strength and Stability Calculation Programs*, *see also* Pt 5, Ch 4,6.

1.2 Application

1.2.2 At the discretion of LR, ship types which are specifically covered by LR's *Rules and Regulations for the Classification of Ships* or other ~~LR's~~ LR Rules and Regulations for Classification may be considered for classification in accordance with these Rules and Regulations. *See* 9.1.1.

1.4 Owner's responsibilities

1.4.1 The Owner is to give LR Surveyors every facility and necessary access to carry out their survey duties. The Owner should familiarise himself with the relevant ~~LR's~~ LR Rules and, where appropriate, arrange that all sub-contractors, suppliers of components, materials or equipment do the same.

■ *Section 3*
Character of Classification and Class notations

3.1 General

3.1.2 The character symbols identify whether the ship is built under LR Class and survey, the suitability for sea-going service, the provision of anchor handling equipment and the ~~rules~~ Rules used for the construction of the ship. The character symbols are described in 3.2.

3.5 Ship type notations

(*Part only shown*)
3.5.6 **NS3** vessels:

(a) Vessels are to be certified for Intact and Damaged Stability, and Carriage of Munitions by a ~~Recognised~~ recognised Organisation. Other statutory requirements such as compliance with the International Convention for the Prevention of Pollution from Ships should also be issued by a recognised Organisation.
(f) The limits of the Operating Envelope to which the hull structure has been approved, are to be displayed prominently in the wheelhouse.
(g) Where a vessel is to be ~~Classed~~ classed using this approach, any exemptions are to be agreed by the Naval Administration and justified by using the approach set out in Vol 2, Pt 1, Ch 5, *Requirements for Machinery and Engineering Systems of Unconventional Design*.

(*Part only shown*)
Table 2.3.1 Hull, Military and Other Class Notations

Military Distinction ✠ MD	Others
	CEPAC Crew and Embarked Personnel Comfort ~~EP~~ ~~Environmental Protection~~ ~~EP~~ ~~Environmental protection~~ **LI** Approved Loading Instrument

3.6 Service area notations

(*Part only shown*)
Table 2.3.1 Hull, Millitary and Other Class Notations (*see continuation*)

Mandatory Notations		Other Notations		
Ship Type	Service Area	Hull Strength	Military Distinction ✠ MD	Others
				~~EP~~ ENV Environmental Protection ~~EP~~ ~~Environmental protection~~

3.8 Military Distinction notations

(*Part only shown*)
3.8.1 Military Distinction notations may be assigned if a particular feature relating to military loads has been incorporated in the design. The requirements for all the Military Distinction notations are given in Part 4.

EB1 **External air blast notation**. This confidential notation indicates that the ship is capable of meeting the structural requirements to withstand an external blast compatible with a specified performance level using the ~~rule~~ Rule loads and structural design methodology.

EB2 **External air blast notation**. This confidential notation indicates that the ship is capable of meeting the structural requirements to withstand an external blast compatible with a specified performance level using the ~~rule~~ Rule loads and an elasto-plastic structural design methodology.

EB3 **External air blast notation**. This confidential notation indicates that the ship is capable of meeting the structural requirements to withstand an external blast compatible with a specified performance level using the ~~rule~~ Rule loads and ~~an~~ a finite element structural design methodology.

3.9 Machinery and Engineering Systems notations

(*Part only shown*)

3.9.1 The following class notations are associated with the machinery construction and arrangement, and may be assigned:

ELS This notation will be assigned where both the quality and integrity of ~~on bord~~ onboard electrical power supplies for designated loads meet the requirements of a relevant and acceptable Naval Standard, such as NATO Standardization Agreement (STANAG) 1008. It also denotes that the installation has been arranged, installed and tested in accordance with LR Rules.

3.10 Other notations

(*Part only shown*)

3.10.1 **LAP.** This optional special feature Class notation will be assigned to the ship in respect of the lifting appliances fitted which are designed and built in accordance with LR's *Code for Lifting Appliances in a Marine Environment* (LAME) or equivalent standard, but where it is not mandated by the LA notation, *see* ~~3.9.2~~ 1.1.12. This notation will be assigned in association with a register of lifting appliances listing the appliances covered. The register, which is to be attached to the Classification Certificate, is the responsibility of the Owner and should include the following lifting appliances, where fitted as appropriate:

3.11 Tailoring – Departures from the Rules and Rule additions

3.11.4 A ~~Technical~~ technical justification is to be provided for each deviation from the Rule requirements. In some cases a full justification and Risk Assessment may be required. *See* Requirements for Machinery and Engineering Systems of Unconventional Design, Vol 2, Pt 1, Ch 5 and Risk Assessment (RA) Vol 2, Pt 1, Ch 2,17.

■ *Section 4*

Surveys – General

4.1 New construction

(*Part only shown*)

4.1.9 **Escape and Emergency Access – ESC**

The arrangements for escape and emergency access are to be examined to ensure the following escape of personnel and emergency access objectives have been satisfied:

(a) **Escape of Personnel Objective**. The ship is to be arranged so that all spaces have means of safe and effective escape for personnel to a designated place of safety, during reasonably ~~foreseeable~~ forseeable emergency situations.

4.4 Damages, repairs and alterations

4.4.3 Where repairs are to be carried out by a riding crew during a voyage, then these must be planned in advance. A complete repair procedure, including the extent of the proposed repair and the need for a Surveyor's attendance during the voyage, is to be submitted reasonably in advance to the Surveyor for agreement. Failure to notify LR in advance of the repairs may result in the Class of the ship being specially considered by the Classification Committee. Where ~~semergency~~ emergency repairs are effected immediately due to an extreme emergency circumstance, the repairs should be documented in the ship's log and submitted thereafter to LR for use in determining further survey requirements.

4.5 Existing ships – Periodical Surveys

4.5.3 The Owner should notify LR whenever a ship can be examined in dry dock or on a slipway. An inspection of the underwater hull and its appendages is to be carried out not less than twice every six years. The maximum period between inspections of the hull and its appendages in dock or in-water is not to exceed three and a half years. Consideration may be given at the discretion of LR to any special circumstances justifying an extension of the maximum periods between inspections. A **Docking Survey** is to be carried out concurrently with the Special Survey. The required Docking Survey is considered to coincide with the Special Survey when held within the six months prior to the due date of the Special Survey. *See* 4.5.5. Where the Special Survey of the hull is carried out on a Continuous Survey basis, as given in 4.5.10, the survey in ~~dry-dock~~ dry dock may be held at any time within the six-year cycle.

4.5.15 Upon application by an Owner, LR may agree to the extension of the survey requirements for main propulsion machinery, which, by the nature of the ship's normal service, ~~do~~ does not attain the number of running hours recommended by the machinery manufacturer for major overhauls within the survey periods given in 4.5.14.

4.5.16 When, at the request of an Owner, it has been agreed by LR that the Complete Survey of the machinery may be carried out on a Continuous Survey basis, the various items of machinery are to be opened for survey in rotation, so far as is practicable, to ensure that the interval between consecutive examinations of each item will not exceed six years. In general, approximately ~~one-sixth~~ one sixth of the machinery is to be examined each year. A record indicating the date of satisfactory completion of the Continuous Survey cycle will be made in the vessel's Classification record. *See also* 4.5.20.

4.5.19 Where machinery installations include a 'lifed item' (an item of machinery, component or equipment necessary for the safety and reliability of propulsion, steering or other essential auxiliary engineering system) which is subject to an overhaul and/or ultimate life limitation, i.e., a period (expressed in operating hours or cycles and/or calendar time) at which the item is to be overhauled or scrapped, the life limitations are to be observed and take precedence over the periodicity of 4.5.14 and 4.5.16 where the life limitation is less than the survey periodicity. Examples may include rolling bearing elements, gas turbines, ~~turbo-chargers~~ turbochargers, flexible couplings and gear box elements. The manufacturer's maintenance and service instructions are to be strictly observed. Where machinery installations include a 'lifed item' details will be noted in the classification records as a Memorandum (Machinery) record.

All instances of turbo-charger(s) *have been amended to* turbocharger(s) *throughout this Rules set as applicable.*

4.7 Notice of surveys

4.7.2 Timely notice to an Owner about forthcoming surveys is available by means of access to LR's ~~ClassDirect Live~~ Class Direct. The omission of such notice, however, does not absolve the Owner from their responsibility to comply with LR's survey requirements.

All instances of ClassDirect Live *have been amended to* Class Direct *throughout this Rules set.*

All instances of Class Direct Live *have been amended to* Class Direct *throughout this Rules set.*

All instances of CDLive *have been amended to* Class Direct *throughout this Rules set.*

■ *Section 6*
Classification of machinery with [✠]LMC or MCH notation

6.3 Survey and inspection

(*Part only shown*)
6.3.3 Acceptance of manufacturer's certificates for items of machinery for propulsion (including propulsion gearing with single input/output arrangements) and for electrical power generation and for other auxiliary machinery for essential services where the ✠ LMC notation is to be assigned, is subject to the following conditions:

(a) The vessel is an NS3 ship ~~or an NS4 ship~~ or an NSA ship of less than 500 gross tonnage or is a ship of 500 gross tonnage or greater and is not required to comply with international conventions applicable to a ship with unrestricted service.

(*Part only shown*)
6.3.4 Acceptance of the manufacturer's certificate for propelling and essential auxiliary machinery, where the MCH notation is to be assigned, is subject to the following conditions:

(a) The ship is an NS3 ship ~~or an NS4 ship~~ or an NSA ship of less than 500 gross tonnage or is a ship of 500 gross tonnage or greater and is not required to comply with international conventions applicable to a ship with unrestricted service.

■ *Section 7*
Classification of ship with *IWS notation

7.2 Appraisal and records

(*Part only shown*)
7.2.1 To facilitate survey and compilation of classification records, the following plans and particulars are to be submitted to LR for appraisal and information.

(a) Details of how the rudder pintle and bush clearances are to be measured and how the security of the pintles in their sockets ~~are~~ is to be verified with the ship afloat.

Volume 1, Part 1, Chapter 3

Periodical Survey Regulations

CORRIGENDA

■ *Section 1*
General

1.4 Documentation

(*Part only shown*)
1.4.1 The Owner may wish to retain the originals of certificates issued by LR~~,~~; however, Naval ships are required to carry the following documentation on board so that the attending Surveyor is able to carry out his duties (certified copies of certificates are acceptable):
(a) Endorsable Certificate of Class.

1.6 Preparation for survey and means of access

(*Part only shown*)
1.6.10 For surveys, including close-up survey where applicable, in cargo spaces and ballast tanks, one or more of the following means of access, is to be provided:
(a) Permanent staging and passages through structures.

■ *Section 2*
Annual Surveys – Hull, machinery and optional requirements

2.3 Machinery

2.3.5 Piping systems containing ~~oil fuel~~ fuel oil, lubricating oil or other flammable liquids are to be generally examined and operated as far as practicable, with particular attention being paid to tightness, fire precaution arrangements, flexible hoses and sounding devices.

All instances of an oil fuel *have been amended with a* fuel oil *throughout this Rules set.*

2.3.16 The ~~surveyor~~ Surveyor is to be satisfied that any alterations to approved equipment, piping, cabling and electrical systems in magazine spaces have been approved by LR, *see* Ch 2,4.4.8.

2.4 Other notations

(*Part only shown*)
2.4.2 **Fire Protection (FIRE)**. The arrangements for fire protection, fire detection and extinction are to be examined and are to include the following items:
(e) Examination of the water fire-fighting system, and confirmation that each pump connected to the water ~~fire fighting~~ fire-fighting system, including any emergency fire pump, can be operated separately so that the required jets of water can be produced simultaneously from different hydrants.

■ *Section 4*
Docking Surveys and In-water Surveys

4.2 Docking Surveys

4.2.5 The sea connections and overboard discharge valves, their attachments to the hull and the gratings~~,~~ at the sea inlets are to be examined. Where applicable, pressure testing of the rudder may be required if deemed necessary by the Surveyor.

(*Part only shown*)
4.2.13 When Machinery Naval Class has been adopted, the following items are additionally applicable. The work is to be carried out in accordance with maintenance manuals and the manufacturer's recommendations for servicing and renewals observed.
(d) The inboard shaft seals or glands are to be examined. Where flexible sternglands are fitted, the satisfactory condition of the rubber hose and securing clips is to be confirmed. Where inflatable shaft seals are fitted, their condition and operation ~~is~~ are to be verified.

■ *Section 5*
Special Surveys – Hull requirements

5.3 Examination and testing – General

5.3.2 Double bottom, deep, ballast, peak and other tanks assigned also for the carriage of salt-water ballast~~,~~ are to be tested with a head of liquid to the top of air pipes or to the top of hatches for ballast/cargo holds. Boundaries of ~~oil fuel~~ fuel oil, lubricating oil and fresh water tanks are to be tested with a head of liquid to the maximum filling level of the tank. Tank testing of ~~oil fuel~~ fuel oil, lubricating oil and fresh water tanks may be specially considered based upon a satisfactory external examination of the tank boundaries, and a confirmation from the Commanding Officer stating that the pressure testing has been carried out according to the requirements with satisfactory results.

(*Part only shown*)
Table 3.5.2 Tank internal examination requirements for steel ships

NOTES
2. Where a selected number of tanks ~~are~~ is examined, then different tanks are to be examined at each Special Survey on a rotational basis
4. Where 50% of tanks are to be examined, a minimum of two tanks ~~are~~ is required to be examined depending upon the overall number of tanks.

5.5 Examination and testing – Additional items for composite ships

5.5.2 The hull to deck joint, together with any joints between the deck and deck-houses or superstructures, ~~are~~ is to be examined.

■ *Section 7*
Machinery survey – General requirements

7.2 Complete Survey

7.2.10 Where machinery installation ~~include~~ includes a ‘lifed item’ the requirements of Ch 2,4.5.21 are applicable.

■ *Section 11*
Boilers

11.2 Scope of surveys

11.2.3 The ~~oil fuel~~ fuel oil burning system is to be examined under working conditions and a General Examination made of fuel tank valves, pipes, deck ~~control gear~~ controlgear and oil discharge pipes between pumps and burners.

All instances of control gear *have been amended to* controlgear *throughout this Rules set.*

■ *Section 13*
Screwshafts, tube shafts and propellers

13.2 Normal surveys

13.2.5 Podded propulsion unit screwshaft roller bearings are to be renewed when the residual calculated life at the maximum continuous rating at time of survey~~,~~ no longer exceeds the survey interval. *See* Vol 2, Pt 4, Ch 4,6.3.8.

13.3 Screwshaft Condition Monitoring (SCM)

(*Part only shown*)
13.3.2 Oil lubricated bearings:
(c) Bearing temperatures are to be recorded~~,~~ (two temperature sensors or other approved arrangements are to be provided).

(*Part only shown*)
13.3.3 Water lubricated bearings:
(e) Where a closed cycle water system is used then the pumping and water filtration systems are to be considered part of the continuous survey cycle and are to be subject to a Periodical Survey. Water analysis is to be carried out regularly at intervals not exceeding six months. Samples are to be taken under service conditions and are to be representative of the water

circulating within the sterntube. Analysis results are to be retained on board and made available to LR on request. The analysis is to include the following parameters;

(i) Chloride content
(ii) Bearing material and metal particles content.

(f) The ~~Shaft~~ shaft shall either be constructed of corrosion resistant material or protected with an approved corrosion resistant protective liner or coating. Where a protective liner is used then this shall meet the requirements of Vol 2, Pt 3, Ch 2,4.14 and a means of assessing the condition of this liner or is to be submitted and approved.

(h) There is to be a shaft starting/clutch engagement block to inhibit starting the shaft until lubricating water flow has been established. This is to act as a starting block only. Low lubricating water flow after shaft start is to be signalled by an alarm only with no ~~shut-down~~ shutdown.

■ *Section 14*

Hull planned maintenance, HPMS

14.4 Roles and Responsibilities

(*Part only shown*)

14.4.3 **Lloyd's Register Scheme Manager.** A Scheme Manager will be appointed by LR for each Navy with ships operating the Hull Planned Maintenance Scheme. The Scheme Manager will administer the scheme on an individual ship or group basis, act as a technical consultant to the Navy and train the ships' staff in the methods of hull structural inspection and reporting. He/she will be resident in either a terminal port that the ship uses regularly or the LR office that manages the Navy's account. More details are given in the following paragraphs:

(b) Training

The Scheme Manager will carry out the following actions associated with training:

- Prepare training documentation and training workshops.
- Deliver training to the ship's staff and issue certification (i.e.~~,~~ *Certificate of Authorisation*).
- Maintain the database of authorised ship's officers, available through ~~CDLive~~ Class Direct.
- Arrange for refresher training programmes for the ship's staff at ~~six yearly~~ six-yearly intervals.

■ *Section 15*

Machinery planned maintenance and condition monitoring, MPMS, MCM and RCM

15.1 Introduction

(*Part only shown*)

15.1.3 Navies who operate a planned maintenance scheme that meets the LR requirements will benefit from enhanced arrangements for dealing with machinery surveys. The arrangements provide the following advantages:

(b) A single system can be operated by the Navy covering maintenance, spare parts' supply and survey requirements.

15.4 Basic requirements for approval of MPMS, MCM and RCM schemes

(*Part only shown*)

15.4.5 A technical audit by LR of individual RCM studies selected by LR will follow the following methodology:

(c) Verification that an expected maintenance task list has been drafted, based on typical tasks that would be expected for the relevant item, under any maintenance regime. These would include, but may not be limited ~~too~~ to, system performance analysis checks, standard condition monitoring checks (vibration, electrical characteristics, thermography, etc), inspections of items liable to wear or other age related degradation, i.e. fouling, periodic tests of protective devices, operation of reversionary modes of operation, etc.

15.6 Breakdown or corrective maintenance

15.6.3 The required repair and time scale for completion will be the subject of discussion and agreement with LR and the Navy. It is the responsibility of the Navy to decide whether the ship's mission/operational tasking is more important than completing the repairs within the agreed time. It is accepted that such circumstances are occasionally inevitable, and LR would provide advice on the interim measures that could be introduced until such ~~times~~ time as the required repairs are carried out and the implications on a ship's operating capability of delays in ~~affecting~~ effecting repairs.

Volume 1, Part 3, Chapter 1

General

CORRIGENDA

■ *Section 1*
Rules application

1.5 Interpretation

1.5.1 The interpretation of the Rules is the sole responsibility and at the sole discretion of Lloyd’s Register (hereinafter referred to ~~a~~ as ‘LR’). Where there is any doubt regarding the interpretation of the Rules it is the designers’ responsibility to obtain clarification from LR prior to submission of plans and data for appraisal. Similarly, where there is any doubt regarding the interpretation of the Owners’ requirements it is the designers’ responsibility to obtain clarification from the Owners prior to the submission of plans.

1.6 Aesthetics

1.6.1 LR is not concerned with the general arrangement, layout and appearance of the ship; the responsibility for such matters remains with the Builders and/or ~~Designers~~ designers to ensure that the agreed specification is complied with. LR is however concerned with the quality of workmanship, in this respect the acceptance criteria as required by Rules, LR Survey Procedures or equivalent are to be complied with.

■ *Section 2*
Direct calculations

2.2 Submission of direct calculations

2.2.3 The responsibility for error free specification and input of program data and the subsequent correct transposition of output rests with the ~~Designer~~ designer

■ *Section 5*
Definitions

5.4 Decks

5.4.4 The damage control deck is the lowest deck on which continuous fore and aft access is provided to aid communications and recovery following damage. It is normally above the lowest vertical limit of watertight integrity, the exact location being determined by the relevant sub-division and watertight integrity standard.

■ *Section 6*
Building tolerances and associated repairs

6.1 Overview

6.1.1 The general tolerances for new building and subsequent repairs are to be in accordance with the requirements of the ~~Naval Ship Survey Procedures Manual~~ *Naval Survey Guidance for Steel Ships*.

6.1.3 The requirements of these Rules are primarily concerned with ensuring items (a) and (b). The equipment manufacturer will be able to give advice on the maximum noise or misalignment that can be tolerated from item (c). Aesthetics, item (d), are at the discretion of the Owner.

Volume 1, Part 3, Chapter 2

Ship Design

CORRIGENDA

■ *Section 1*
General

1.2 Definitions

(*Part only shown*)
Fig. 2.1.1 International ~~standards~~ Standards

1.5 Residual Strength Assessment, RSA

1.5.4 A residual strength assessment performed as defined in the Rules~~,~~ assumes that a ship can remain operational for a limited period of time in reduced sea states, *see* Pt 6, Ch 4,1.2. Where a higher operational capability following damage is specified, special consideration will need to be given and revised criteria set.

■ *Section 2*
Rule structural concept

2.2 Scantlings

2.2.9 Scantling requirements in respect of miscellaneous items of structure such as local foundations, base plates, insert plates, bollards, etc., are not specifically indicated within these Rules. However, the acceptance of such items will be specially considered on the basis of experience, good practice and direct calculation where appropriate.

■ *Section 3*
Main hull structure

3.1 General

3.1.11 The corners of large openings in the shell and decks from 0,25L_R to 0,75L_R are to be elliptical, parabolic or circular. Where predominantly ~~undirectional~~ unidirectional stress fields are anticipated, elliptical or parabolic corners are recommended. Where biaxial or torsional stress fields are expected, circular corners are recommended.

3.3 Shell plating

3.3.3 In general, openings are not to be cut in the sheerstrake~~,~~; however, if operational requirements dictate, openings that are less than 20 per cent of the depth of the sheerstrake may be accepted. Openings greater than 20 per cent of the depth of the sheerstrake will require special consideration.

3.4 Shell framing

3.4.7 Bottom girders and side stringers supporting transverse frames~~,~~ are to be continuous through transverse bulkheads and supporting structures. They are to be supported by deep transverse web frames, floors, bulkheads, or other primary structure, generally spaced not more than three metres apart.

3.5 Single bottom structure

3.5.7 Where the floor breadth at the upper edge exceeds 6,0 m, side girders are to be fitted at each side of the centre girder such that the spacing between the side and centre girders or between the side girders themselves is not greater than 3 m. In general, side girders where fitted are to be continuous, extend as far forward and aft as practicable and to terminate in way of bulkheads, deep floors or other primary transverse structure. In addition, continuous intercostal longitudinal stiffeners are to be fitted where the panel size exceeds the ratio 4 to 1.

3.7 Deck structure

3.7.10 Deck structures subject to concentrated loads~~,~~ are to be suitably reinforced. Where concentrations of loading on one side of a stiffening member may occur, such as out of line pillars, the member is to be adequately stiffened againt torsion. Additional reinforcements may be required in way of localised areas of high stress.

3.7.21 Where large side shell openings~~,~~ such as side aircraft lifts~~,~~ are proposed, detailed calculations are to be submitted.

3.8 Deep tank structure

3.8.6 Where decks terminate at deep tanks, suitable scarfing arrangements are to be arranged and the side shell supported by a stringer at deck level. The stringer can be either fully effective or acting as part of a grillage. Bulkhead stiffeners are to be supported at the deck level against tripping.

■ *Section 5*
Fore and aft end arrangements

5.2 Structural continuity

5.2.5 Where longitudinal framing terminates and is replaced by a transverse system, adequate arrangements are to be made to avoid an abrupt changeover. Where a forecastle is fitted extending ~~forwarded~~ forward from 0,85L_R, longitudinal framing at the upper deck and topsides is generally to be continued forward of the aft bulkhead of this superstructure.

5.3 Minimum bow height and extent of forecastle

(*Part only shown*)

5.3.2 All sea-going ships are to be fitted with forecastles, or increased sheer on the upper deck or equivalent, such that the distance from the waterline design draught to the top of the exposed deck at side at the F.P. is not less than:

$$H_b = \left(6075\left(\frac{L_R}{100}\right) - 1875\left(\frac{L_R}{100}\right)^2 + 200\left(\frac{L_R}{100}\right)^3\right) \text{X} \left(2{,}08 + 0{,}609C_b - 1{,}603C_{wf} - 0{,}0129\left(\frac{L_R}{d_1}\right)\right)$$

where

L_R = Rule ~~Length~~ length, in meters

5.4 Bow crumple zone

5.4.1 In general the bow crumple zone is that space forward of the collision bulkhead. Embarked personnel or crew accommodation and the carriage of fuel, hazardous materials and other oils ~~is~~ are not permitted in the bow crumple zone.

■ *Section 6*
Machinery space arrangements

6.6 Double and single bottom structure

6.6.9 Where practicable, side girders outboard of the engines are to be fitted and are to line up with the side girders in adjacent spaces.

6.7 Machinery casings

6.7.3 Machinery casings are to be supported by a suitable arrangement of deep beams or transverses and longitudinal girders in association with pillars or pillar bulkheads. In way of particularly large machinery casing openings, cross ties may ~~by~~ be required, and these are to be arranged in line with deep beams or transverses. Where casing stiffeners carry loads from deck transverses, girders, etc., or where they are in line with pillars below, they are to be suitably reinforced.

6.9 Machinery seatings

6.9.3 Seatings are to be of substantial construction and efficiently supported by transverse and horizontal brackets or gusset plates. These should generally be arranged in line with plate floors and girders in a double bottom or with suitable deep beams or transverses and girders at upper decks. Where applicable, seats are to be designed to ensure proper alignment with gearing and allow for thermal expansion effects.

Volume 1, Part 3, Chapter 3

Ship Control Systems

CORRIGENDA

■ *Section 2* Rudders

2.2 Definition and symbols

2.2.1 Definitions and symbols for use throughout this Section are indicated in the appropriate ~~tables~~ Tables.

2.10 Centre of pressure

Table 3.2.5 Position of centre pressure

Design criteria	Value of X_{PF} and X_{PA}
Rectangular rudders; (a) Ahead condition (b) Astern condition	$X_{PF} = (0{,}33\cancel{e}e_h x_B - x_L)$, but not less than $0{,}12x_B$ $X_{PA} = \left(X_A - 0{,}25x_B\right)$, but not less than $0{,}12x_B$
Non-rectangular rudders; (a) Ahead condition (b) Astern condition	X_{PF} and X_{PA} are to be calculated from geometric form (*see* Note) But not less than: $\dfrac{0{,}12A_R}{y_R}$
Symbols	
x_{PF} =	horizontal distance from centreline of the rudder pintles, or axle, to the centre of pressure in the ahead condition, in metres
x_{PA} =	horizontal distance from the centreline of the rudder pintles, or axle, to the centre of pressure in the astern condition, in metres
x_B =	breadth of rudder, in metres
y_R =	depth of rudder at centreline of stock, in metres
A_R =	rudder area, in m^2
x_L and x_A =	horizontal distances from leading and after edges, respectively, of the rudder to the centreline of the rudder pintles, or axle, in metres
x_s =	horizontal length of any rectangular strip of rudder geometric form, in metres
~~e_h~~ e_h =	hull form factor at ahead condition defined as follows: for $L < 65$ m, ~~e_h~~ $e_h = 1{,}0$ for $L \geq 65$ m
~~e_h~~ e_h =	$2\left(C_b + 10\dfrac{B_{WL}}{L_R} - 2\right)\dfrac{V}{\sqrt{L_R}}$ but not less than 1,0 and need not to be taken greater than $1+\left(\dfrac{L_R - 65}{70}\right)$
L_R, B and C_b are defined in Ch 1,5. V is as defined in 2.11.1.	
NOTE For rectangular strips the centre of pressure is to be assumed to be located as follows: (a) 0,33~~e_h~~ e_h x_s abaft leading edge of strip for ahead condition. (b) $0{,}25x_s$ from aft edge of strip for astern condition.	

2.13 Rudder bending moment, M~R~

(*Part only shown*)
2.13.1 For spade rudders, Type (b) in Fig. 3.2.1, the bending moment, M_R, may be determined from the following formula:

$$M_R = F_R \left(y 1 + \left(\frac{y3\,(2x_l + x_u)}{3\,(x_l + x_u} \right) \right) \text{kNm}$$

(*Part only shown*)
2.13.2 For rudders supported by a rudder horn, Type (a) in Fig. 3.2.1, the bending moment, M_R, may be determined from the following formula:
M_R = $0{,}125F_R\,(y_1 + y_2)$ kNm

2.18 Double plate rudders

(*Part only shown*)
Table 3.2.8 Double plated rudder construction

Item	Requirement
(1) Side plating	~~$t = 0{,}0224\, s\,\beta \sqrt{\frac{P_r}{110k_o}} + 2{,}5\,\text{mm}$~~ $t = 0{,}0224\, s\,\beta \sqrt{\frac{P_r}{110K_o}} + 2{,}5\,\text{mm}$
(3) Top and bottom plates	As (1) above using *s* = maximum rudder width, in mm, at top or bottom, but not less than 900 mm~~.~~

2.39 Watertight gland

2.39.2 Where the top of the rudder tube is significantly higher than the deepest load waterline, a lesser arrangement of watertightness~~,~~ such as ‘O’ rings may be accepted.

2.39.3 The watertight gland body may be formed by the top of the fabricated or cast rudder tube~~;~~, the gland packing being retained against the top bearing or a check in the wall of the rudder tube, and is compressed by a gland packet which may be of the flange type, screwed cap or other suitable arrangement.

■ *Section 3*
Stabiliser arrangements

3.1 General

3.1.8 For non-retractable type stabilisers, a separate watertight box surrounding the shell entry point may be required if the stabiliser is located adjacent to a critical compartment. No stabiliser box is needed if the compartment which it is in has adequate pumping arrangements and the ship has at least a ~~one compartment~~ one-compartment flooded damage capability.

3.1.13 The scantlings of internal watertight bulkheads and stiffening for fixed installations are to be specified by the designer/~~builder~~ Builder and/or fin unit manufacturer, but in no case are to be less than the scantlings for double bottoms as defined in Pt 6, Ch 3. Suitable access is to be provided to allow for maintenance and inspection purposes.

(*Part only shown*)
3.1.14 The scantlings and sealing arrangements for the pedestal and bearings will be specially considered, subject to the designer/~~builder~~ Builder submitting the following:

3.9 Fin plating

3.9.2 The thickness of the nose plates is not to be less than 1,25 times the thickness of the fin side plating. The thickness of web plates is not to be less than 70 per cent of the thickness of the fin side plating, or 6 mm, whichever is the greater.

■ *Section 4*

Rudder horns and appendages

4.5 Shaft brackets

4.5.7 The length of the shaft bracket boss, l_b, is to be sufficient to support the length of the required bearing. In general l_b is not to be less than 4d_t, where d_t is the Rule diameter of the screwshaft, in mm, *see* Vol 2, Pt 3, Ch 2,4.4. Proposals for a reduction in the required shaft bracket boss length will be considered in conjunction with details of the bearing material, allowable bearing operating pressure and installation arrangements, *see* Vol 2, Pt 3, Ch 2,4.16.2. However, in no case is l_b to be less than the greater of:

(a) 2d_t;
(b) that recommended by the bearing manufacturer;
(c) as required by 4.4.2.

(*Part only shown*)
4.5.8 Where the shaft and the shaft bracket boss are of the same material, the thickness of the shaft bracket boss is not to be less than d_t/4. Where the shaft and the shaft bracket boss are of dissimilar materials, the thickness of the boss, t_b, is to be not less than:

$$t_b = 0{,}75\mathrm{dt}\left(\sqrt[3]{f_1} - 0{,}667\right)\mathrm{mm}$$

NOTE
In no case is t_b to be taken as less than 12 mm~~.~~

4.5.9 The design of the shaft brackets with regard to disturbance of the hydrodynamic flow into the propeller and rudders is ~~out with~~ outwith the scope of classification.

■ *Section 5*

Fixed and steering nozzles, bow and stern thrust units, ducted propellers

5.8 Propeller ducting

5.8.1 Where propellers are fitted within ducts/tunnels, the plating thickness in way of the blades is to be increased by 50 per cent.

5.10 Novel features

5.10.1 Where the Rules do not specifically define the requirements for novel features, ~~then~~ the scantlings and arrangements are to be determined by direct calculations. Such calculations are to be carried out on the basis of the Rules, recognised ~~standards~~ Standards and good practice, and are to be submitted for consideration.

■ *Section 6*

Water jet propulsion systems

6.1 Construction

(*Part only shown*)
6.1.2 Water jet ducts may be fabricated as an integral part of the hull structure, or as a ~~bolted in~~ bolted-in unit. In either case, detailed plans indicating dimensions, scantlings and materials of construction of the following are to be submitted in triplicate.

(a) Arrangement of the system including intended method of attachment to the hull and building-in, geometry of tunnel, shell opening, method of stiffening, reinforcement, etc.

6.2 Water jet propulsion systems – Installation

6.2.4 For ~~‘bolted in’~~ ‘bolted-in’ units, hull receiving rings are to be of a material compatible with the hull. Scantlings of the receiving rings are to be as required by the jet unit manufacturer and suitably edge prepared prior to welding in place. The receiving ring is to be installed using an approved welding procedure. Where a manufacturer’s specification is not provided, full details are to be submitted

Volume 1, Part 3, Chapter 5

Anchoring, Mooring, Towing, Berthing, Launching, Recovery and Docking

CORRIGENDA

■ *Section 10*
Launch and recovery, berthing and dry-docking arrangements

10.4 Dry-docking loads

Table 5.10.1 has been reinstated as per the 2013 Rules and amended as shown.

Table 5.10.1 Acceptance criteria

Structural item	Allowable stresses, *see* Note		Minimum buckling factor
	σ_e	τ	λ
Double bottom girders	$0{,}75\sigma_L$	$0{,}35\sigma_o$	1,2
Double bottom floors	$0{,}75\ \sigma_L$	$0{,}35\sigma_o$	1,1

Symbols

σ_o = specified minimum yield stress of material σ_o for steels having a yield stress above 355 N/mm^2 will be specially considered

σ_L = $\dfrac{235}{k_L}$ N/mm^2

λ = factor against elastic buckling

σ_e = Von Misses equivalent stress = ~~$\sqrt{\sigma x^2 + \sigma\, y^2 - \sigma y \sigma x = 3\tau_{xy}^{\;2}}$~~ $\sqrt{\sigma x^2 + \sigma y^2 - \sigma_y \sigma_x + 3\tau_{xy}^{\;2}}$

NOTE
In areas where the openings have not been modelled, the resulting shear stress and Von Mises stress is to be corrected according to the ratio of the actual to the modelled shear area. If the resulting stress levels exceed 90% of the specified allowable values, further study by means of fine mesh follow up models may be required. Von Mises stresses are to be recalculated on the basis of the corrected shear stresses.

Volume 1, Part 3, Chapter 5

Figure 5.10.1 has been reinstated as per the 2013 Rules.

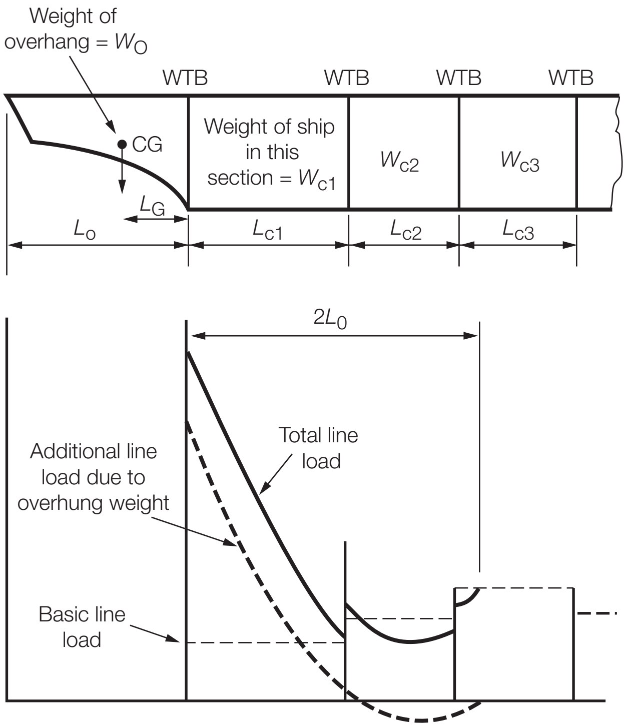
Weight of overhang = W_O
WTB
WTB
WTB
WTB
CG
Weight of ship in this section = W_{c1}
W_{c2}
W_{c3}
L_G
L_o
L_{c1}
L_{c2}
L_{c3}
$2L_0$
Total line load
Additional line load due to overhung weight
Basic line load

Fig.5.10.1
Calculation of dock block loads in way of the after cut-up

10.5 Launching loads

~~*10.5.1* In accordance with Pt 6, Ch 1,2.2.6 a dry-docking plan is to be submitted as a supporting document. Consideration should be given throughout the design of a vessel to producing a dry-docking plan. The dry-docking plan should include, but not be limited to, the following information:~~

- ~~The permissible locations of dock furniture;~~
- ~~Maintenance and withdrawal envelopes;~~
- ~~The arrangement of underwater fittings and openings.~~

~~The dry-docking plan should take into account multiple likely docking arrangements for maintenance and through-life support.~~

The launching loads are to be checked by the shipbuilder using conventional analytical methods appropriate to the method of launch. If via a slipway, the structure in way of the fore poppet should be suitable for the high loads that will be transmitted in this area. If adequate structure is not available, temporary stiffening is to be arranged.

Volume 1, Part 3, Chapter 6

Structural Procedures for the Design, Construction and Lifetime Care of Ships

CORRIGENDUM

■ *Section 5*
Ship Event Analysis

5.1 Ship Event Analysis – Class notations SEA(HSS-n), SEA(VDR), SEA(VDR-n)

5.1.2 Where a hull surveillance system is fitted the class notation **SEA(HSS-n)** will be assigned. Where a voyage data recorder system is fitted the class notation **SEA(VDR)** or **SEA(VDR-n)** will be assigned. The extension **-n** signifies the number of fitted strain gauges connected to the system. The appropriate class notation(s) will be entered in column 6 of the *Register Book*, *see also* Pt 1, ~~Ch 2,3.9.5~~ Pt 1, Ch 2, 3.9.4 of the Rules for Ships.

Volume 1, Part 4, Chapter 1

Military Design

CORRIGENDUM

■ *Section 7*
Design guidance for nuclear, biological and chemical defence

7.1 General

7.1.1 The arrangements of hull structure for chemical, biological, radiological and nuclear defence (CBRN) are to generally be in accordance with the requirements of this Section. The final design and arrangements are to be in accordance with the requirements of the Naval Authority. Where specifically requested, LR can undertake the inspection and certification of CBRN arrangements or ~~gas tight~~ gastight integrity, *see* Pt 6, Ch 6,6.8.

Volume 1, Part 4, Chapter 2

Military Load Specification

CORRIGENDUM

■ *Section 8*
Strengthening requirements for beach landing operations

8.5 Rubbing strakes

8.5.2 ~~Rubbing strakes are to be spaced not less than 1,5 m apart. For closer spacing the thickness of the bottom shell will be specially considered.~~ It is recommended that rubbing strakes are not to be spread more than 1,5m apart. For rubbing strakes spaced greater than 1,5m the bottom structure is to be specially considered.

Volume 1, Part 5, Chapter 2

Environmental Conditions

CORRIGENDA

■ *Section 2*
Wave environment

2.2 Service areas

(*Part only shown*)
2.2.2 The service area notations listed below are available. The definitive extents of the service areas are shown in Fig. 2.2.2 and Table 2.2.3. The chart shows the minimum service area requirement for operating in different areas of the world.

SA4 Service Area 4 covers ships designed to operate in Sheltered water, as defined in ~~Pt 1, Ch 2,2.2~~ Pt 1, Ch 2,2.2.12. This service area excludes operating in sea areas for which a **SA1**, **SA2** or **SA3** notation is required.

2.2.5 Under normal circumstances, a ship which is assigned a service area notation **SA2**, **SA3**, **SA4** or **SAR** is to operate in solely the designated area and is not transit to other areas of the world, *see* ~~Pt 1, Ch 2,1.1~~ Pt 1, Ch 2,3.5. Due allowance is to be made for the ship's trials, work-up period and delivery voyages in the assignment of a service area notation. However special consideration may be appropriate to these periods in order to ensure that the ship is not subjected to dynamic loads which might impair the structural working life of the ship.

Volume 1, Part 5, Chapter 4

Global Design Loads

CORRIGENDUM

■ *Section 3*
Global hull girder loads

3.3 Vertical wave bending moments

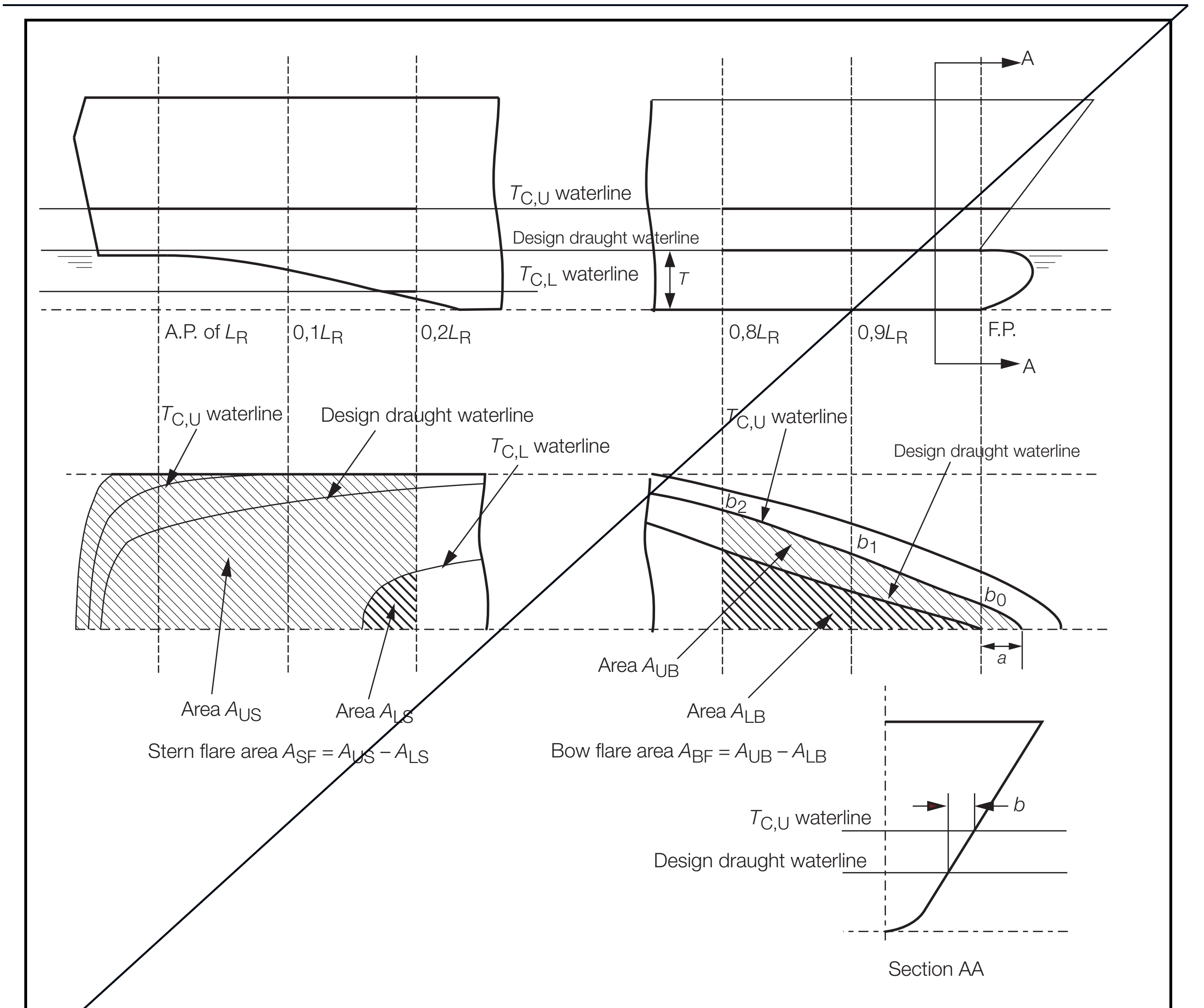

Fig. 4.3.1 Derivation of bow and stern flare areas

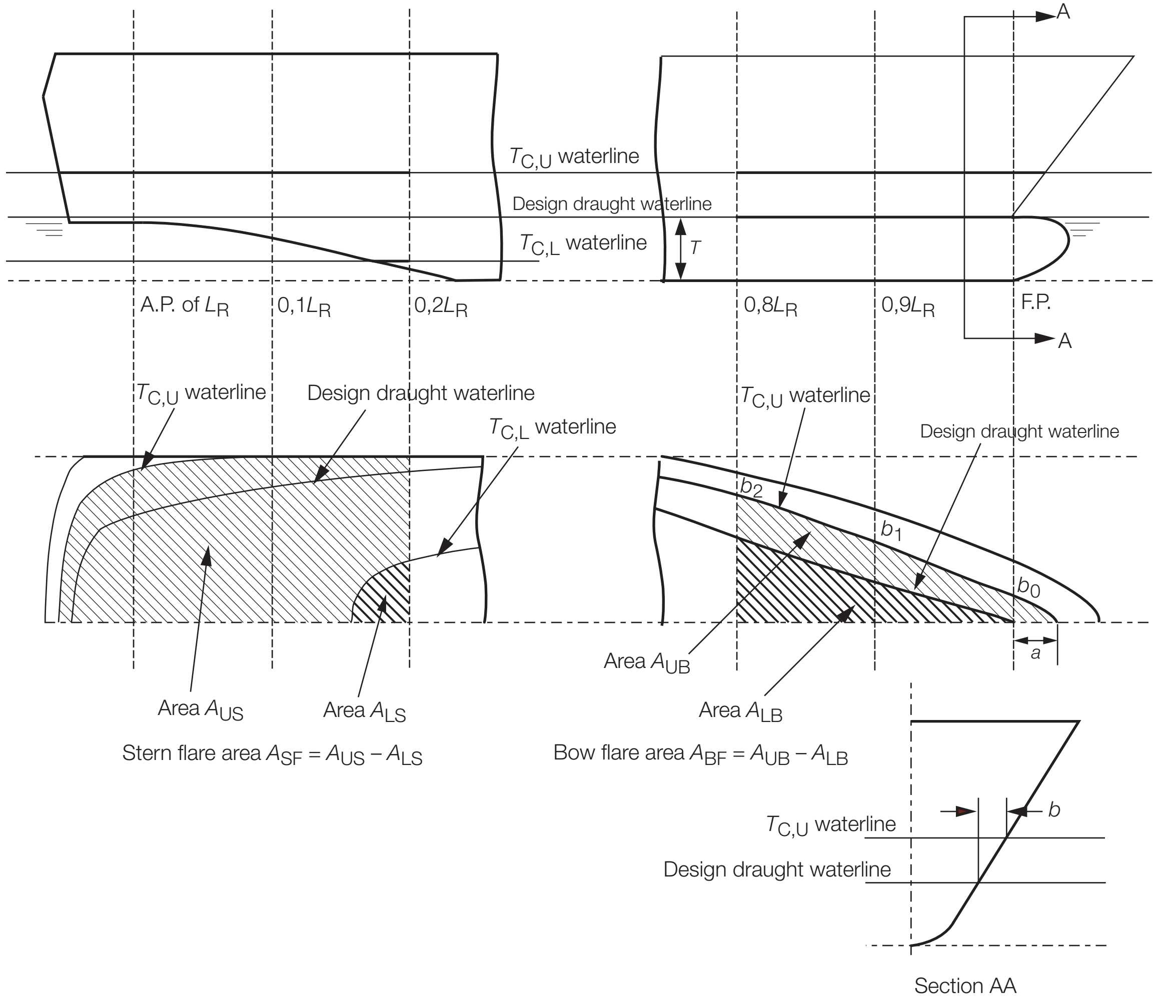

Fig. 4.3.1 Derivation of bow and stern flare areas

Volume 1, Part 6, Chapter 3

Scantling Determination

CORRIGENDA

■ *Section 2*
Minimum structural requirements

2.1 General

Table 3.2.2 Vessel type correction factor (ω)

Vessel type	ω
Bottom structure of ships operating aground	1,2
NS1	1,1
NS2 and ~~3~~ NS3	1,0

■ *Section 3*
NS1 scantling determination

3.14 Single and double bottom structures

(*Part only shown*)

Table 3.3.12 Single bottom construction forward, minimum requirements

Area	Item	Requirement
Transverse framing minimum requirements		
Floors in tanks	Spacing	every frame
	Depth, in mm	d_f = 83D + 150 or 1400 whichever is the lesser
	Thickness, in mm	~~$t = (5,5 + 0,23L_2)\sqrt{s_2/800}$~~ $t = (5,5 + 0,023\,L_2)\sqrt{s_2\,/\,800}$
	Face plate area, in cm^2	$A_f = 0,8S\,k_s\,B$

■ *Section 8*
Double bottom structures

8.11 Double bottom structure in machinery rooms

8.11.3 Where the double bottom is longitudinally framed and transverse floors are fitted in way of the engine seatings as required by Pt 3, Ch ~~3,6.6~~ 2.6.6, no additional longitudinal stiffening is required in way of the engines other than the main engine girders, provided that the spacing of girders does not exceed 1,5 times the normal spacing of longitudinals. Where this spacing of girders is exceeded, shell longitudinals are to be fitted. These are to scarf into the longitudinal framing clear of the machinery spaces. The scantlings of the longitudinals are to be determined in accordance with the appropriate requirements for bottom shell longitudinals using a minimum span of 1,3 m.

■ *Section 12*
Pillars and pillar bulkheads

12.5 ~~Minimum slenderness ratio~~ Slenderness ratio

■ *Section 16*
Masts

16.4 Stayed masts

16.4.5 Wire rope stays are to be in one length and their construction is to comply with the requirements of Chapter ~~6~~ 8 of the *Code for Lifting Appliances in a Marine Environment* (LAME).

Volume 1, Part 6, Chapter 6

Material and Welding Requirements

CORRIGENDA

■ *Section 2*
Materials

2.10 Corrosion margin

2.10.3 For naval auxiliaries with scantlings in accordance with the *Rules and Regulations for the Classification of Ships* (**NSA**) ~~or vessels with scantlings in accordance with the *Rules and Regulations for the Classification of Special Service Craft* (**NS4**),~~ the corrosion margins, where specified in those Rules, are to be applied.

■ *Section 4*
Welded joints and connections

4.5 Fillet welds

(*Part only shown*)

Table 6.4.1 Weld factors

Item	Weld factor	Remarks
(7) ~~Construction in 0,25*L* forward:~~ Construction forward of 0,75L_R:		
Floors and girders to shell and inner bottom	0,21	
Bottom longitudinals to shell	0,13	
Transverse and longitudinal side framing to shell	0,13	
Tank side brackets to frame and inner bottom	0,34	
Panting stringers to shell and frames	0,34	
Fore peak construction:		
all internal structure	0,13	Unless a greater weld factor is required

Volume 2, Part 1, Chapter 2

Requirements for Machinery and Engineering Systems of Unconventional Design

CORRIGENDUM

■ *Section 5*
Machinery space arrangements

5.13 Fire detection, alarm and extinguishing arrangements

5.13.1 Machinery spaces and enclosures are to be provided with fire detection, alarm and extinguishing systems in accordance with the fire safety arrangements required by the Regulations in Vol 1, Pt 1, Ch 2,1.1.10. For unattended machinery spaces, a fire detection system in accordance with Pt 9, Ch ~~1,3.5~~ 1.4.5 is to be fitted.

Volume 2, Part 1, Chapter 3

Requirements for Design, Construction, Installation and Sea Trials of Engineering Systems

CORRIGENDA

■ *Section 3*
Documentation required for design view

3.2 Documentation

3.2.5 Where an oil or liquefied petroleum gas fired galley is proposed, details of the oil and gas storage and distribution arrangements together with ventilation arrangements and safety ~~shut-down~~ shutdown and alarm are to be submitted.

3.3 Calculations and specifications

3.3.16 **Machinery operation**. For mobility and ship type category engineering systems, the equipment/machinery manufacturer's instructions for installation and operation of lubricating and hydraulic oil systems are to be made available to the LR Surveyors attending trials/testing/commissioning. The instructions should include information that may affect the safety and reliability of the equipment covering requirements for operating environment, monitoring arrangements, cleanliness, filter arrangements, oil change intervals and precautions to be taken at start-up, in operation and during prolonged periods of ~~shut-down~~ shutdown.

■ *Section 4*
Operating conditions

4.1 Availability for operation

4.1.6 Installed machinery is to be capable of operating satisfactorily in accordance with the ~~manufacturers~~ manufacturer's stated operating conditions within defined training and drill regimes specified by the Owner and agreed by the shipyard and machinery/equipment manufacturer, *see* 3.3.18.

4.9 Military requirements

(*Part only shown*)

4.9.2 The following aspects are to be considered for machinery and engineering systems where military requirements are defined:

- ~~Shut-down~~ Shutdown and isolation of HVAC systems. The foregoing list is not exhaustive and additional aspects may be specified and included by the Owner.

Volume 2, Part 1, Chapter 3

■ *Section 5*
Machinery space arrangements

5.3 Machinery fastenings

5.3.1 Bedplates, thrust seatings and other fastenings are to be of robust construction, and the machinery is to be securely fixed to the ship's structure to the satisfaction of the Surveyor. For NS3 type ships or where specified, the arrangement is to be such that it is sufficient to restrain the dynamic forces arising from vertical and horizontal acceleration appropriate to the intended service, *see* 3.3.5 and 5.4.

Volume 2, Part 2, Chapter 1

Diesel Engines

CORRIGENDA

■ *Section 9*
Control and monitoring

9.1 General

(*Part only shown*)
9.1.2 Oil mist detection, engine bearing temperature monitors or alternative methods for crankcase protection are to be provided:

(a) When arrangements are fitted to override the automatic shutdown for excessive reduction of the lubricating oil supply pressure.
(b) For engines of 2,250 kW and above or having cylinders of more than 300 mm bore.

NOTES
1. For medium and high speed engines automatic ~~shut-down~~ shutdown of the engine is to occur.
3. Where arrangements are made to override the automatic slow-down or ~~shut-down~~ shutdown due to high oil mist or bearing temperature, the override is to be independent of other overrides.

9.6 Unattended machinery

9.6.2 Where a first stage alarm together with a second stage alarm and automatic ~~shut-down~~ shutdown of machinery are required by Tables 1.9.1(a) and (b) and 1.9.2, the sensors and circuits utilised for the second stage alarm and automatic ~~shut-down~~ shutdown are to be independent of those required for the first stage alarm.

(*Part only shown*)
Table 1.9.1(b) Diesel engines for propulsion purposes: Alarms and ~~shut-downs~~ shutdowns

Item	Alarm	Note
Lubricant oil inlet pressure	2nd stage low	Automatic ~~shut-down~~ shutdown of engines, *see* 9.6.2
Oil mist concentration in crankcase or bearing temperature	High	Automatic ~~shut-down~~ shutdown of medium and high speed engines, *see* 9.1.2
Cylinder coolant outlet temperature	2nd stage High	Automatic ~~shut-down~~ shutdown of medium and high speed engines, *see* 9.6.2
Overspeed	High	Automatic ~~shut-down~~ shutdown of engine, *see also* 9.4. Details of alternative proposals in accordance with the manufacturer's instructions may be submitted for consideration.

(*Part only shown*)

Table 1.9.2 Auxiliary diesel engines: Alarms and ~~shut-downs~~ shutdowns

Item	Alarm	Note
Lubricating oil inlet pressure	1st stage low	–
	2nd stage low	Automatic ~~shut-down~~ shutdown of engine, *see* 9.6.2
Oil mist concentration in crankcase or bearing temperature	High	Automatic ~~shut-down~~ shutdown of engine, *see* 9.1.2
~~Oil fuel~~ Fuel oil high pressure piping	Leakage	*See* 9.6.3
Coolant outlet temperature (for engines >220 kW)	1st stage high	–
	2nd stage high	Automatic ~~shut-down~~ shutdown of engine, *see* 9.6.3
~~Oil fuel~~ Fuel oil temperature or viscosity	High and Low	Heavy oil only
Overspeed	High	Automatic ~~shut-down~~ shutdown of engine, *see also* 9.4. Details of alternative proposals in accordance with the manufacturer's instructions may be submitted for consideration

9.7 Diesel engines for propulsion purposes

9.7.3 Alarms are to operate, and automatic ~~shut-down~~ shutdown of machinery is to occur for the fault conditions shown in Table 1.9.1(b).

■ *Section 10*
Alarms and safeguards for emergency diesel engines

10.1 General

Table 1.10.1 Alarms and safeguards for emergency diesel engines

Item	Alarm	Alarm	Note
Emergency diesel engine	≥ 220 kW	< 220 kW	–
Fuel oil leakage from pressure pipes	Leakage	Leakage	*See* 9.6.3
Lubricating oil temperature	High	–	–
Lubricating oil pressure	Low	Low	–
Oil mist concentration in crankcase	High	–	*See* ~~note~~ Note
Coolant pressure or flow	Low	–	–
Coolant temperature (can be air)	High	High	–
Overspeed High	–		Automatic ~~shut-down~~ shutdown

NOTE
For engines having a power of more than 2250 kW or a cylinder bore of more than 300 mm.

10.1.4 Regardless of the engine output, if ~~shut-downs~~ shutdowns additional to those specified in Table 1.10.1 are provided except for the overspeed ~~shut-down~~ shutdown, they are to be automatically overridden when the engine is in automatic or remote control mode during navigation.

10.1.6 In addition to the fuel oil control from outside the space, a readily accessible local means of engine ~~shut-down~~ shutdown is to be provided.

■ *Section 12*
Mass produced ~~turbo-chargers~~ turbochargers

■ *Section 15*
Electronically controlled engines

15.5 Control engineering systems

(*Part only shown*)
15.5.2 The engine control, alarm monitoring and safety systems are to be configured to comply with the relevant requirements (e.g.~~,~~ operating profile, alarms, ~~shut-downs~~ shutdowns, etc.) of this Chapter and Pt 9, Ch 7 for an engine for main, auxiliary or emergency power purposes. Details of the engine configuration are to be submitted for consideration, identifying:
(a) Local and remote means to carry out system configuration.

Volume 2, Part 2, Chapter 2

Gas Turbines

CORRIGENDUM

■ *Section 10* Control, monitoring, alert and safety systems

10.7 Stopping of gas turbines

10.7.3 *See also* Pt 1, ~~Ch 1,4.1.1~~ Ch 2,4.15 for requirements for stopping machinery from a position outside the compartment where the machinery is located.

Volume 2, Part 2, Chapter 3

Steam Turbines

CORRIGENDA

■ *Section 7* Control and monitoring

7.5 Steam turbines for propulsion purposes

7.5.2 Where a first stage alarm together with a second stage alarm and automatic ~~shut-down~~ shutdown of machinery are required by Tables 3.7.1 and 3.7.2, the sensors and circuits utilised for the second stage alarm and automatic ~~shut-down~~ shutdown are to be independent of those required for the first stage alarm.

(*Part only shown*)

Table 3.7.1 Steam turbine machinery: Alarms and safeguards

Item	Alarm	Note
Lubricating oil pressure for turbines and gearing	1st stage Low	–
	2nd stage	Automatic ~~shut-down~~ shutdown *see* 7.5.2
Turbine vibration	High	~~Shut-down~~ Shutdown or speed reduction of turbine(s)
Axial movement of turbine rotor	High	
Main condenser vacuum	Low	
Main condenser condensate level	High	
Overspeed	High	*See 7.2*

(*Part only shown*)

Table 3.7.2 Steam turbine machinery: Additional alarms and safeguards

Item	Alarm	Note
Lubricating oil inlet pressure	1st stage Low	–
	2nd stage* Low	Automatic ~~shut-down~~ Shutdown of turbine*, *see* 7.5.2
Condenser vacuum	Low	Automatic shut-down shutdown of turbine*
Axial displacement of rotor	High	

Volume 2, Part 3, Chapter 1

Gearing

CORRIGENDA

■ *Section 8*
Sub-systems for gearing

8.4 Gearbox dehumidification

8.4.1 All gearboxes installed in **NS1** and **NS2** category ships are to be fitted with a dehumidifier to remove moist air from the gearcase during periods of ~~shut-down~~ shutdown.

■ *Section 9*
Control and monitoring

9.2 Unattended machinery

(*Part only shown*)

Table 1.9.1 Alarms and safeguards

Item	Alarm	Note
Lubricating oil inlet pressure*	1st Stage Low	Slow-down of prime mover
	2nd Stage Low	Automatic ~~shut-down~~ shutdown of prime mover

Volume 2, Part 4, Chapter 4

Podded Propulsion Units

CORRIGENDUM

■ *Section 8*
Control engineering arrangments

8.2 Monitoring and alarms

8.2.7 Condition monitoring arrangements are not to interface with the operation of safety systems which may cause slow-down or ~~shut-down~~ shutdown of the propulsion system. *See also* Pt 9, Ch 7, 4.6.8.

Volume 2, Part 5, Chapter 1

Torsional Vibration

CORRIGENDUM

■ *Section 3*
Design

3.2 Limiting stress in propulsion shafting

3.2.3 In no part of the propulsion shafting system may the alternating torsional vibration stresses exceed the values of τ_c for continuous operation, and τ_t for transient running, given by the following formulae:

~~$\tau_c = \frac{\sigma u + 160}{18} C_k C_d \left(3 - 2r^2\right)$ for $r < 0{,}9$ N/mm^2~~

~~$\tau_c = \frac{\sigma u + 160}{18} C_k C_d 1{,}38$ for $0{,}9 \leq r < 1{,}05$ N/mm^2~~

~~$\tau_t = \pm 1{,}7 \tau_c \frac{1}{\sqrt{C_k}}$ for $r \leq 0{,}8$~~

For $\tau_c < 0{,}9$:

$$\tau_c = \frac{\sigma u + 160}{18} C_k C_d \left(3 - 2r^2\right) \text{N/mm}^2$$

$$\tau_t = = + 1{,}7 \tau c \frac{1}{\sqrt{Ck}} \left(for < 0{,}8\right)$$

For $0{,}9 < \tau < 1{,}05$:

$$\tau_c = \frac{\sigma u + 160}{18} C_k C_d \, 1{,}38 \text{ N/mm}^2$$

Volume 2, Part 7, Chapter 2

Ship Piping Systems

CORRIGENDA

■ *Section 1*
General requirements

1.1 Application

1.1.3 Where ship piping systems are required to satisfy requirements for the prevention of pollution, reference is to be made to the applicable requirements for **POL** and ~~**EP**~~ **ENV** class notations. *See* Vol 3, Pt 3, Ch 6 and Vol 3, Pt 2, Ch 2.

■ *Section 7*
Pipe systems and their fittings

7.1 Prevention of communication between compartments

7.1.3 All valves and cocks mentioned in ~~7.7.1 and 7.7.2~~ 7.1.1 and 7.1.2 which can be operated from the damage control deck are to have their controls at their place of operation clearly marked and provided with means to indicate whether they are open or closed.

Volume 2, Part 7, Chapter 3

Machinery Piping Systems

CORRIGENDA

■ *Section 2*
~~Oil fuel~~ Fuel oil – General requirements

2.9 Precautions against fire

2.9.9 Drip trays are to be fitted at the furnace mouths to intercept oil escaping from the burners, and under all other ~~oil fuel~~ fuel oil appliances which are required to be opened up frequently for cleaning or adjustment.

■ *Section 3*
~~Oil fuel~~ Fuel oil burning arrangements

3.1 Oil burning units

(*Part only shown*)
3.1.12 It is to be demonstrated to the Surveyor’s satisfaction during trials that burner shut-off times due to flame failure comply with the following requirements and details of the procedures and means used to set this time interval are to be submitted for consideration:

(b) The time interval between flame failure detection and closing of burner ~~oil fuel~~ fuel oil valve(s) is to be long enough to prevent ~~shut-down~~ shutdown due to incorrect detection of a flame failure under normal operational circumstances but is to be set to minimise the quantity of unburned ~~oil fuel~~ fuel oil delivered to the furnace and the possibility of subsequent damage as a result of unintended ignition.

■ *Section 4*
~~Oil fuel~~ Fuel oil pumps, pipes, fittings, tanks, etc.

4.17 ~~Oil fuel~~ Fuel oil service tanks

4.17.1 ~~An oil fuel~~ A fuel oil service tank is a an oil fuel tank which contains only the required quality of fuel ready for immediate use.

■ *Section 6*
Boiler feed water, condensate and thermal fluid circulation systems

6.2 Feed and circulation pumps

6.2.5 The forced circulation flow required by 6.2.4 is to be maintained on completion of engine ~~shut-down~~ shutdown for a sufficient duration in accordance with the exhaust gas economiser/boiler/thermal heater manufacturer’s instructions. Details of arrangements are to be submitted for approval.

■ *Section 8*
Lubricating oil systems

8.6 Emergency supply for propulsion turbines and propulsion turbo-generators

8.6.4 For automatic ~~shut-down~~ shutdown arrangements of main turbines in the event of failure of the lubrication system, *see* Pt 2, Ch 2,5.1 and Ch 3,4.3.

Volume 2, Part 7, Chapter 3

■ *Section 9*
Control, supervision and monitoring of equipment

9.2 Automatic and remote controls

9.2.3 Where a first stage alarm together with a second stage alarm and automatic ~~shut-down~~ shutdown of machinery are required in the relevant Tables of this Section, the sensors and circuits utilised for the second stage alarm and automatic ~~shut-down~~ shutdown are to be independent of those required for the first stage alarm.

9.3 Thermal fluid heaters

9.3.8 Following burner ~~shut-down~~ shutdown, the furnace is to be purged automatically for at least the required pre-purging time. In event of ~~shut-down~~ shutdown due to activation of a required safeguard this purging is to be manually initiated.

(*Part only shown*)

Table 3.9.3 Miscellaneous machinery: Alarms and safeguards

Item	Alarm	Note
Air compressor lubricating oil	Failure	Automatic ~~shut-down~~ shutdown

■ *Section 12*
Air compressors and air starting arrangements

12.1 General requirements

12.1.5 Each compressor is to be fitted with an alarm for failure of the lubricating oil supply which will initiate an automatic ~~shut-down~~ shutdown.

Volume 2, Part 7, Chapter 4

Aircraft/Helicopter/Vehicle Fuel Piping and Arrangements

CORRIGENDA

■ *Section 2*
Refuelling facilities

2.1 Fuel storage

2.1.20 *See* Pt 10, ~~Ch 1,1.12~~ Ch 1,1.14 for requirements for control of static electricity.

2.2 Independent ~~oil fuel~~ fuel oil tanks

2.2.3 For rectangular steel tanks of welded construction, the plate thicknesses are to be not less than those indicated in Table ~~4.3.1~~ 4.2.1. The stiffeners are to be of approved dimensions

Volume 2, Part 7, Chapter 5

Ship Type Piping Systems

CORRIGENDA

■ *Section 4*
Control arrangements

4.1 General

(*Part only shown*)
4.1.6 Refrigeration compressors for chilled water systems are to be provided with the following instrumentation and automatic ~~shut-downs~~ shutdowns:
(e) Automatic ~~shut-down~~ shutdown in the event of low lubricating oil pressure.
(f) Automatic ~~shut-down~~ shutdown in the event of high discharge pressure which is to operate at a pressure in excess of normal operating pressure but not greater than 0,9 of the maximum working pressure.
(g) Automatic ~~shut-down~~ shutdown in the event of a low suction pressure.

(*Part only shown*)
4.1.8 Air compressors are to be provided with the following instrumentation and automatic ~~shut-downs~~ shutdowns:
(e) Automatic ~~shut-down~~ shutdown in the event of low lubricating oil pressure.
(f) Automatic ~~shut-down~~ shutdown in the event of high discharge pressure.

（*Part only shown*)
4.1.9 Alarms are to be initiated in the event of the following fault conditions with the refrigerant compressors for cooling water systems and air compressors:
(f) Motor ~~shut-down~~ shutdown.

4.1.11 All pumps are to be provided with an indication of discharge pressure, a low discharge pressure alarm and a motor ~~shut-down~~ shutdown alarm.

■ *Section 8*
High pressure compressed air systems

8.2 Compressors

8.2.4 Each compressor is to be provided with an alarm for failure of the lubricating oil supply that will initiate an automatic ~~shut-down~~ shutdown.

Volume 2, Part 8, Chapter 1

Steam Raising Plant and associated Pressure Vessels

CORRIGENDA

■ *Section 18*
Control and monitoring

18.2 Automatic and remote controls

18.2.10 Following burner ~~shut-down~~ shutdown, the furnace is to be purged automatically for at least the required pre-purging time. In event of ~~shut-down~~ shutdown due to activation of a required safeguard this purging is to be manually initiated.

Volume 2, Part 11, Chapter 2

Heating, Ventilation and Cooling Arrangements

CORRIGENDA

■ *Section 4*
Control and monitoring and electrical power arrangements

4.1 General

(*Part only shown*)
4.1.8 Refrigeration compressors are to be provided with the following instrumentation and automatic ~~shut-downs~~ shutdowns:
(e) Automatic ~~shut-down~~ shutdown in the event of low lubricating oil pressure.
(f) Automatic ~~shut-down~~ shutdown in the event of high discharge pressure which is to operate at a pressure in excess of normal operating pressure but not greater than 0,9 of the maximum working pressure.
(g) Automatic ~~shut-down~~ shutdown in the event of a low suction pressure.

(*Part only shown*)
4.1.10 Alarms are to be initiated in the event of the following fault conditions with refrigeration compressors:
(f) Motor ~~shut-down~~ shutdown.

Volume 2, Part 11, Chapter 3

Waste Systems

CORRIGENDUM

■ *Section 1*
General requirements

1.2 Scope

1.2.2 Oily wastes from machinery and other spaces are within the scope of the ~~**EP**~~ **ENV** and **POL** class notations, *see* Vol 3, Pt 2, Ch 2 and Vol 3, Pt 3, Ch 6.

Volume 2, Part 12, Chapter 1

Emissions Abatement Plant for Combustion Machinery

CORRIGENDA

■ *Section 3*
Information to be submitted

3.3 Chemical substances

(*Part only shown*)
3.3.7 The flow and return flow of chemicals, substances, effluent or by-products, including:
(b) The process plant parameters and analysis of conditions under which emergency ~~shut-down~~ shutdown will be initiated.
(d) The proposed emergency procedures for controlled ~~shut-down~~ shutdown of the plant, i.e.~~,~~ depressurising, isolating and the arrangements for the continued operation of the essential services necessary to allow for such controlled ~~shut-down~~ shutdown under the emergency conditions identified in 3.3.7(b), as applicable.

3.4 Mechanical equipment

3.4.5 Details of the by-pass arrangements or, where considered unnecessary, evidence demonstrating that the emissions abatement plant is capable of continued operation with the expected gas flows. Evidence is to include conditions where the emissions abatement plant is in a ~~shut-down~~ shutdown condition, both as a result of emergency conditions and when ~~shut down~~ shutdown for normal operational reasons. This is to be supported by detailed proposals demonstrating material suitability and is to ensure that, where there is a risk of blockage, this can be monitored so as to ensure that remedial action can be taken before blockage presents a risk to both combustion machinery and emissions abatement plant operations.

■ *Section 9*
Electrical and control equipment

9.1 General

9.1.5 Process tanks which form part of the operating loop of any emissions abatement equipment are to have a high-level alarm, in accordance with Table 1.9.1. Effluent tanks which are not part of the normal process loop and which are used for storage of effluent or substances prior to discharge from the vessel are to be protected, in accordance with Table 1.9.1. Tank alarm and trip sensors are to be positioned at a point that will allow the system ~~shut-down~~ shutdown to operate before the tank overflows, based on the maximum design flow rates and ~~shut-down~~ shutdown response time. Where a low level is identified as presenting a risk to crew or machinery, tanks are to have a low-level alarm and a low-level trip. These are to be positioned so as to operate before a low level results in a hazardous condition, based on system design flow rates and a system ~~shut-down~~ shutdown response time.

(*Part only shown*)

Table 1.9.1 Machinery emissions to air abatement plant: alarms and safeguards

Item	Alarm	Note

NOTES
1. Only where a by-pass valve is fitted, *see* 3.4.5. This valve shall open to the by-pass position as part of the unit ~~shut-down~~ shutdown logic.
2. Only where fitted, *see* 6.3.1.
3. The process tank is any tank forming part of a wet abatement system flow loop or effluent tanks which receive bleed-off from the main flow loop, or such tanks not forming part of the system flow loop but which are essential for operation of the system, including those on exhaust gas recirculating installations, *see* 7.1.9. Where low level can present a hazard, process tanks are also to have low-level protection.
4. Where chemical substances are to be kept within a defined temperature range, alarms will be fitted, based on the allowable temperature range, *see* 3.4.4, 5.1.2 and 7.1.10.
5. Chemical spillage detection alarm will depend on the means of spill containment fitted, *see* 5.1.2.
6. Wet emissions abatement unit shall include such systems fitted as part of the exhaust gas recirculating installations.

Volume 3, Part 1, Chapter 4

Manoeuvring Assessment

CORRIGENDUM

■ *Section 1*
General

1.4 Sister ships

1.4.5 For a sister ship to a ship carrying the **LNMA** notation the ship will be required to verify performance at sea trials. The manoeuvres to be conducted are to be agreed between LR, the Owner and the Naval Administration in the sea trial procedures.

Volume 3, Part 1, Chapter 5

Replenishment at Sea (RAS) Systems

CORRIGENDUM

■ *Section 6*
Ship and arrangement requirements

6.5 Location and layout of stores

6.5.1 The number, type and location of stores are to be consistent with the routes leading to/from RAS stations. The layout of each store is to recognise the need ~~rapidly to strike down~~ to rapidly strike down equipment and provisions and is to be agreed between the designer and Owner.

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